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10/500,280	06/28/2004	Hillegonda Bakker	TS6320uS	9209

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EXAMINER	
PETTITT, JOHN F	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/500,280	BAKKER ET AL.	
	Examiner	Art Unit	
	/John Pettitt/	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/13/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The examiner notes that the applicant's submission of an information disclosure document dated 08/13/2007 containing the references Engle (US 3,259,145) and Atkinson (US 2,683,972), is after the date of the final rejection (07/12/2007) wherein the examiner employs Engle and Atkinson. Therefore, the references have already been considered.

Claim Objections

2. **Claims 1-19** are objected to because of the following informalities:

In regard to claim 1, the recitation, "to swirl in downward direction alongside the inner surface of the tubular section of the vessel into a liquid collecting tank at or near the bottom of the vessel" (lines 11-13) several terms lack antecedent basis and should be corrected to read --to swirl in **a** downward direction alongside **an** inner surface of the tubular section of the vessel into a liquid collecting tank at or near **a** bottom of the vessel--.

The recitation, "wherein the plurality of a liquefied and/or solidified condensables enriched fluid outlets are connected at regular circumferential intervals to the tubular section of the secondary separation vessel which outlets inject in use condensables enriched fluid in an at least partially tangential direction into the interior of the secondary separation vessel." (lines 18-22) should read -- wherein the plurality of a liquefied and/or solidified condensables enriched fluid outlets are connected at regular circumferential intervals to the tubular section of the secondary separation vessel **and the enriched**

fluid outlets inject in use condensables enriched fluid in an at least partially tangential direction into **an** interior of the secondary separation vessel.--.

In regard to claim 10, the recitation, "wherein at least the primary gas cooling device each of which has a liquefied and/or solidified condensables enriched outlet" (lines 2-3) is inconsistent with the plurality of cooling devices and must be consistent with the independent claim and is assumed to read --wherein at least the **plurality of** primary gas cooling devices each of which has a liquefied and/or solidified condensables enriched outlet--.

In regard to claim 13, the recitation, "wherein at least one gas cooling device " (line 2) should read --wherein at least one **of the plurality of primary** gas cooling device**s**--.

In regard to claim 17, the recitation, "and centrifugal forces to swirl in downward direction alongside the inner surface of the tubular section of the vessel into a liquid collecting tank at or near the bottom of the vessel" (lines 14-16) several terms lack antecedent basis and should read --and centrifugal forces to swirl in a downward direction alongside **an** inner surface of the tubular section of the vessel into a liquid collecting tank at or near a bottom of the vessel--.

The recitation, "wherein a plurality of secondary fluid injection outlets are connected at regular circumferential intervals to the tubular section of the secondary separation vessel, which outlets inject condensables enriched fluid in an at least partially tangential direction into the interior of the secondary separation vessel." (lines 21-24) creates confusion about which outlets are being recited the enriched outlets or

other outlets and therefore should read --wherein a plurality of secondary fluid injection outlets are connected at regular circumferential intervals to the tubular section of the secondary separation vessel, **and the enriched fluid** outlets inject **the** condensables enriched fluid in an at least partially tangential direction into **an** interior of the secondary separation vessel.--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1-7, 12, and 16-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson (US 2,683,972) hereafter Atkinson in view of Engle (US 3,259,145) hereafter Engle.

In regard to claim 1, Atkinson teaches an apparatus comprising a primary gas cooling device (13-vortex tube) which has a liquefied and/or solidified condensables enriched fluid outlet (14 or inlets for 14 in wall of 11) an a primary condensables depleted fluid outlet (17); a secondary fluid separation vessel (11) having a tubular section of which a central axis has a substantially vertical orientation, which vessel is connected to said condensables enriched fluid outlet (14 or inlets for 14 in wall of 11) of said primary gas cooling device (13), wherein during normal operation of the vessel the condensables enriched fluid is induced to swirl around the central axis of the tubular

section of the vessel (as with the high speed at which the fluid will enter the vessel (11) there will be swirling fluid which will be forced to swirl around the central axis of the tubular section by the walls of the vessel (11)) such that a tertiary stream (interpreted as a third stream) of liquefied and/or solidified condensables is induced by gravity and centrifugal forces to swirl in a downward direction alongside an inner surface of the tubular section of the vessel (11) into a liquid collecting tank (either 12, 29, or both) at or near a bottom of the vessel (11), which tank (either 12, 29, or both) is provided with a heater (18) for heating the tertiary mixture to reduce the amount of solidified condensables and with one or more outlets (33, 32) for discharging the tertiary mixture from the tank (either 12, 29, or both); the enriched fluid outlet (14 or inlets for 14 in wall of 11) also injects in use condensables enriched fluid in an at least partially tangential direction (partially tangential being interpreted to mean in any direction not parallel to the radius of the tubular section) into an interior of the secondary separation vessel (11).

Atkinson does not teach a plurality of primary gas cooling devices nor that the outlets of such are connected at regular circumferential intervals to the tubular section of the secondary separation vessel. However, as is commonly known in the art and taught by Engle (column 1, lines 47-60) a vortex tube provides colder temperatures as the flow rate through the cold outlet is *decreased*, therefore, by adding additional vortex tubes (in the same manner as the one vortex tube is provided) in parallel to the secondary separation vessel (11) of Atkinson the flow rate through each of the individual vortex tubes would be decreased and the condensation temperature would be lowered or alternatively for a set condensation temperature a greater volume of

condensables would be liquefied increasing the productivity of the system. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify separation system of Atkinson with a plurality of vortex tubes as taught by Engle to increase the capacity of the system to improve the processing capacity of the system.

In regard to claim 2, Atkinson teaches that the liquid collecting tank (12, 29) comprises an upper liquid outlet (33) and a lower liquid outlet (32).

In regard to claim 3, Atkinson teaches that the separation vessel (11) is equipped with a tertiary gas outlet conduit (containing stream 21) having an inlet (see Fig. 1) which is located at or near the central axis of the tubular section.

In regard to claim 4, Atkinson teaches that the separation vessel (11) has a dome shape which is mounted on top of the tubular section (see Fig. 1) and the tertiary gas outlet conduit is arranged substantially co-axial to the central axis of the tubular section and passes through said top.

In regard to claim 5, see claim 1.

In regard to claim 6, the combination discussed above for claim 1 results in the plurality of primary cooling device outlets to inject in use condensables enriched fluid in an at least partially tangential and partially downward direction into the interior of the secondary separation vessel (11).

In regard to claim 7, Atkinson teaches that the collecting tank (12) is formed by a cup-shaped tubular lower portion of the secondary separation vessel (11) which is

substantially co-axial to the central axis and has a larger internal width than the upper portion of the vessel (11).

In regard to claim 12, Atkinson teaches that the liquid collecting tank (12) is provided with a grid of heating tubes that are designed to heat the liquid and solid fluid mixture in the tank to a temperature of at least 15 degrees Celsius (column 4, lines 1-12).

In regard to claim 16, the combination discussed for claim 1 would result in each of the gas cooling devices having a choke (15; choke is interpreted as orifice or restriction).

In regard to claim 17, see remarks for claim 1.

In regard to claim 18, see the combination discussed for claim 1; further, Atkinson teaches that the fluid mixture is a natural gas stream which is cooled in the gas cooling devices comprising one or more primary cyclonic inertia separators (13) to a temperature below 0 degrees Celsius (equivalent to 32 degrees Fahrenheit; column 3, line 70) thereby condensing and/or solidifying aqueous and hydrocarbon condensates and gas hydrates and the tertiary fluid mixture comprises water, ice, hydrocarbon condensates, and gas hydrates and is heated in the tertiary collection tank to a temperature above 15 degrees Celsius (column 4, lines 1-12) and from which tank low density hydrocarbon condensates are discharged through an upper liquid outlet (33) and high density aqueous components are discharged through a lower liquid outlet (32).

In regard to claim 19, see the combination discussed for claim 17; further, Atkinson teaches that liquefied and/or solidified components are separated from the

gaseous components by centrifugal force in the primary gas cooling devices (column 2, lines 45-50).

5. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Engle and further in view of Coggins et al. (US 4,208,196) hereafter Coggins. Atkinson and Engle teach all of the limitations of claim 1 except that a vortex breaker (interpreted as any structure which is positioned to dissipate the kinetic energy of a fluid) be arranged in the interior of the secondary separation vessel between the lower end of the tubular section and the liquid collecting tank. However, Coggins teaches that providing a slat structure between a spinner and a liquid collection tank is well known in the art for the purpose of enhancing the liquefaction efficiency of oil well separators. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the system discussed for claim 1 with a slat structure as taught by Coggins to further improve the liquefaction efficiency (so that more of the desired hydrocarbon content of the fluid entering the system may be recovered).

6. **Claim 9 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson in view of Engle and further in view of J.K. Skrebowski et al. (US 3,411,309) hereafter Skrebowski. Atkinson and Engle teach all of the limitations of claim 9 but do not explicitly teach ultrasonic vibration transducers on one or more components of the assembly capable of vibrating in use one or more components of the assembly at a frequency between 20 and 200 kHz. However, Skrebowski teaches a vibration

transducer (3) which vibrates a crystallizer at frequency of 30 kHz (column 1, line 64-65) or between 0.5 and 100 kHz (column 1, lines 60-65). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the assembly of Atkinson and Engle with the vibration means of Skrebowski in all locations where freezing is found (inevitably on the coldest locations such as outlets 14 and locations between outlets 14 and tank 12) for the purpose of ensuring that no frozen deposits retard flow through the system.

7. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson, Engle, Coggins and further in view of Skrebowski. Atkinson, Engle, and Coggins teach all of the limitations of claim 10, but do not explicitly teach that the plurality of primary cooling devices (13) and the vortex breaker (slat) are equipped with ultrasonic vibration transducers. Skrebowski teaches a vibration transducer (3) which vibrates a crystallizer at frequency of 30 kHz (column 1, line 64-65) or between 0.5 and 100 kHz (column 1, lines 60-65) for the purpose of removing and maintaining frozen deposits off of the coldest surfaces. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the assembly of Atkinson and Engle with the vibration means of Skrebowski in all locations where freezing is found (inevitably on the coldest locations such as outlets 14 and the vortex breaker) for the purpose of ensuring that no frozen deposits retard flow through the system and for the further purpose of allowing such deposition to be prevented while still maintaining a high efficiency of liquefaction.

8. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Atkinson, Engle, and further in view of Alferov et al. (US 6,372,019) hereafter Alferov.

In regard to claim 13, Atkinson and Engle teach all of the limitations of claim 13 but do not explicitly teach that the vortex tube (13) of Atkinson comprises an expansion nozzle, one or more swirl imparting vanes, or a diverging outlet section equipped with a central primary condensables depleted outlet conduit and an outer secondary condensables enriched fluid outlet conduit. However, Alferov teaches a primary cyclonic inertia separator (Fig. 1) comprising an expansion nozzle (5; column 6, lines 10-15; column 4, lines 20-25, 45-50; capable of such temperature function; depends on the operating conditions and working fluids) by a substantially isnentropic expansion (interpreted to mean an expansion that has relatively low losses, column 7, lines 58-65) and one or more swirl imparting vanes (4; column 5, line 65) which can induce the fluid to swirl into a diverging outlet section (all elements to the right of 9 and including 9) equipped with a central primary condensables depleted fluid outlet conduit (13) and an outer secondary condensables enriched fluid outlet conduit (11). Alferov teaches that the separator provides increased separation efficiency (column 4, lines 25-30). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the plurality of vortex tubes of Atkinson and Engle with the more efficient separators Alferov for the purpose of increasing the separation efficiency of the process.

In regard to claim 14, Alferov teaches that each primary cyclonic inertia separator (Fig. 1) comprises an expansion nozzle (5) designed to accelerate the fluid mixture within the nozzle (5) to a supersonic speed (column 2, line 53, column 4, line 1), thereby cooling the temperature of the fluid passing through the nozzle to a temperature lower than -20 degrees Celsius (capable of such function; depends on the operating conditions and the working fluid).

Comment [j1]: Make it easyt to see the combination

In regard to claim 15, the combination of Atkinson, Engle, and Alferov as discussed relative to claim 13 teaches a plurality of primary cyclonic inertia separators (Fig. 1-Alferov) of which the expansion nozzles (Alferov-5) are substantially parallel and equidistant to the central axis of the tubular section (set by the diameter of 11 - Atkinson and Engle) of the secondary separation vessel (Atkinson and Engle - 11) and of which the secondary condensables enriched fluid outlets (Atkinson and Engle - inlet for 14 in wall of 11) are connected to the secondary fluid injection conduits (Alferov - 11) which intersect the wall of the tubular section of the secondary separation vessel (11) at regular circumferential intervals and in an at least partially tangential direction (as stated before in claim 1), and which secondary fluid injection conduits (Alferov - 11) each have a length less than 4 meters (clear by column 12, lines 20-30; at least a portion of conduits 11 ensured to have a length less than 4 meters).

Response to Arguments

9. Applicant's arguments filed 01/08/2008 have been fully considered but they are not persuasive. Applicant's arguments (page 8, ¶ 2) are an allegation that the vortex tube of Atkinson does not produce a condensables enriched fluid. In response to the applicant's arguments, the examiner fully disagrees as the outlet (14) fully meets the claimed structure. The applicant is reminded that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Further the applicant argues (page 8, ¶ 2) are that the prior art does not teach a condensables depleted fluid outlet. In response to the applicant's arguments, the examiner fully disagrees and directs the applicant to the detailed action above.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to /John Pettitt/ whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Comment [j2]:
1. (Currently Amended) A multistage fluid separation assembly comprising: a plurality of primary gas cooling devices each of which has a liquefied and/or solidified condensables enriched fluid outlet and a primary condensables depleted fluid outlet; and, a secondary fluid separation vessel having a tubular section of which a central axis has a substantially vertical or tilted orientation, which vessel is connected to said condensables enriched fluid outlets of said primary gas cooling devices, wherein during normal operation of the vessel the condensables enriched fluid is induced to swirl around the central axis of the tubular section of the vessel such that a tertiary stream of liquefied and/or solidified condensables is induced by gravity and centrifugal forces to swirl in downward direction alongside the inner surface of the tubular section of the vessel into a liquid collecting tank at or near the bottom of the vessel for collecting a tertiary mixture of liquefied and/or solidified condensables, which tank is provided with one or more heaters for heating the tertiary mixture to reduce the amount of solidified condensables and with one or more outlets for discharging the tertiary mixture from the tank;
wherein the plurality of a liquefied and/or solidified condensables enriched fluid outlets are connected at regular circumferential intervals to the tubular section of the secondary separation vessel which outlets inject in use condensables enriched fluid in an at least partially tangential direction into the interior of the secondary separation vessel.

2. (Previously Presented)The fluid separation assembly of claim 1, wherein the liquid collecting tank comprises an upper liquid outlet for low density liquid components and a lower liquid outlet for high density liquid components.

3. (Previously Presented) The fluid separation assembly of claim 1, wherein the tubular section of the secondary separation vessel is equipped with a tertiary gas outlet conduit having an inlet which is located at or near the central axis of the tubular section.

4. (Previously Presented)The fl ... [1]

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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February 21, 2008

/Frantz F. Jules/
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